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ABSTRACT

This program guide is intended for the implementation of a floriculture program in Florida secondary and postsecondary schools. The program guide describes the program content and structure, provides a program description, describes jobs under the program, and includes a curriculum framework and student performance standards for floriculture courses. The curriculum framework outlines major concepts and content, laboratory activities, program specifics, and intended outcomes; the student performance standards guide lists each standard and the behaviors expected to show mastery of each standard. The guide also provides a test item bank and information on the following: facilities, equipment, and supplies; program implementation (student admission requirements, safety and maintenance, student learning guide, cooperative training, and student organizations); teacher professional development and professional organizations; and instructional resources (a list of 81 print materials, 12 audiovisual aids, 2 computer programs, 26 sources for print materials, 18 sources for audiovisual materials, and the Florida Educational Information Service with a list of its services). Appended to the program guide is a sample student learning guide that includes program title, intended outcome, learning activities, information sheets, self-check with answers, written test with answers, and a performance test. (KC)

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FLORIDA VOCATIONAL PROGRAM GUIDE FOR

FLORICULTURE

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FLORICULTURE

State of Florida
Department of Education
Tallahassee, Florida
Betty Castor, Commissioner
Affirmative action/equal opportunity employer

Division of Vocational, Adult, and Community Education
Bureau of Vocational Program and Staff Development

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INTRODUCTION

The Florida Vocational Program Implementation Guide can be applied to all vocational programs in Florida. This program guide, however, was developed specifically for the Floriculture program to provide information that will be useful to local school-district and community-college administrators, faculty and instructors, program advisory committee members, regional coordinating councils, regional criminal justice training centers, and others charged with the responsibility of offering vocational education programs. The final planning and evaluation of any educational program, however, must be done within the context of local conditions. This publication will serve to identify the major concerns that should be considered in the organization, operation, and evaluation of a vocational education program.

Vocational education has evolved to meet the needs of students desiring to pursue selected careers or vocations. In general, vocational education is designed to provide programs, services, and activities that are realistic in light of present and future employment opportunities. In recent years, applications of science and technology have expanded rapidly, increasing the education and training required of personnel. The new technologies require many additional technical supportive staff to carry out both standardized and specialized procedures.

Today, vocational education is an increasingly viable option for students. The Florida Department of Education (DOE) shares with business, government, and industry the determination to provide opportunities for upward mobility to as many Floridians as possible. For this to become a reality, exemplary career educational programs must be created and these programs must be consistent throughout the state.

State Board of Education Administrative Rule 6A-10.24: Articulation between universities, community colleges, and school districts outlines steps and guidelines that will bring about a systematic interrelationship among Florida institutions offering similar or related courses and programs. The rule states, in part, that

> when a student transfers among postsecondary vocational-technical centers, community colleges, and universities, the receiving institution shall award credit for courses satisfactorily completed at the previous institutions when the courses are judged to be equivalent to courses offered at the receiving institution.

This program guide helps ensure that equivalency. Throughout Florida, vocational programs, if implemented according to the criteria described in this document, will help many citizens fill an important place in our state and national work force.

PROGRAM CONTENT AND STRUCTURE

The content of the Floriculture program is based on occupational competencies and employability skills required on the job in Floriculture. The basic content of this program is described in the Florida Curriculum Framework and the Student Performance Standards (SPSs). To meet the local needs of the work force, the SPSs may be modified by local education agencies.

Students enrolled in this program should be able to benefit from the instructional content with reasonable expectations for entry-level employment upon successful completion of the program.

This section includes a program description, job titles in Floriculture, information on licensure and credentialing, program structure in relation to other programs in the horticulture area, and the Curriculum Framework and Student Performance Standards for Floriculture.

Program Description

Agribusiness and Natural Resources Education (ANRE) is a group of planned, specialized instructional programs structured to enable students to begin and to refine prescribed competencies required for employment in a cluster of Agribusiness and Natural Resources occupations.

The Floriculture program in ANRE includes learning experiences, both classroom and practical, that are concerned with providing students with an initial exposure to the skills and attitudes associated with a career in floricultural business and industry.

The skills and attitudes that are basically related to producing, processing, and marketing plants, shrubs, and trees used principally for ornamental, recreational, aesthetic, and functional purposes are indicated as intended outcomes in the Curriculum Framework of this guide.

Job Titles

Job titles for Floriculture are as follows:

Greenhouse Superintendents (DOT #405.131-101)
Horticultural-Specialty Farming, Supervisors (DOT #405.131-010)
Horticultural Workers II (DOT #405.687-014)
Plant Propagators (DOT #405.361-010)

Licensure and Credentialing

The jobs listed above do not require special licensure or certification, and advancement to supervisor and to manager within an occupation depends on experience, aptitude, attitude, and training.

However, students who have completed the Floriculture program can be certified as nursery professionals by passing the certifying examination offered by the Florida Nursery Growers Association (FNGA) or can be licensed as restricted pesticide applicators by passing examinations administered by the Cooperative Extension Service through the Florida Department of Agriculture and Consumer Services.

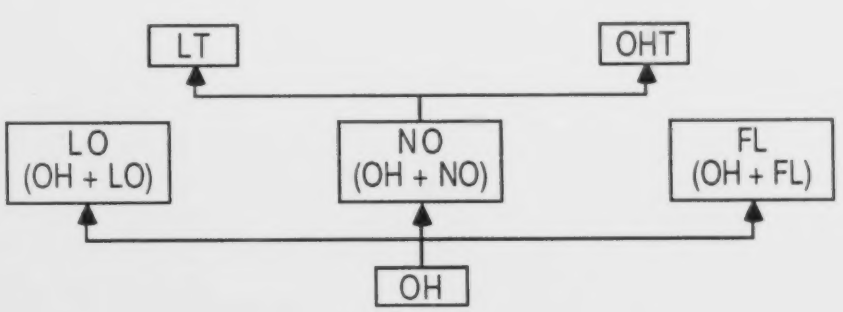
Program Structure

The cluster of horticulture programs consists of Ornamental Horticulture (OH), Floriculture (FL), Nursery Operations (NO), and Landscape Operations (LO). These programs include content that is common to all of them. This common content makes up the Ornamental Horticulture program, which is a three-credit program at the secondary level and a 450-hour program at the postsecondary adult level. It is a job preparatory program as well as a preparatory program for the other horticulture-related programs.

The Floriculture program consists of the Ornamental Horticulture program and a three-credit (or 450-hour) Floriculture course; the Landscape Operations program consists of the Ornamental Horticulture program and a three-credit (or 450-hour) Landscape Operations course; and the Nursery Operations program is made up of the Ornamental Horticulture program and a three-credit (or 450-hour) Nursery Operations course. Therefore, those students who have completed the Ornamental Horticulture program and then enrolled in any of the three related programs (Floriculture, Landscape Operations, or Nursery Operations) can skip the first half of the program and study only the program-specific second half. Those students who have completed any one of these three programs and then enrolled in one of the other two programs can skip the first half of that program.

(Associate degree programs in Landscape Technology and Ornamental Horticulture Technology are offered at community colleges.)

A relationship among these horticulture-related programs is depicted as follows:



Test Item Bank

A bank of multiple-choice test items was developed to measure students' achievement on the SPSs of the Nursery Operations program. These items are based on the 1988 version of the Nursery Operations SPSs. Although these items are not designed to measure the Floriculture SPSs, you may find them helpful for developing tests for the Floriculture program. For information on how to obtain these test items, contact the Occupational Program Director (904/488-0482) or the program specialist for your region.

Curriculum Framework and Student Performance Standards

The Curriculum Framework and Student Performance Standards provided on the following pages are for the Floriculture program. The standards are suggested but not required. It is strongly recommended that you and your program advisory committee review and revise them to meet your community's work-force needs.

The Curriculum Framework--effective July, 1989--which appears on the following pages, indicates that a student takes Floriculture courses 1-6. However, this will change in 1990, when the program will consist of the following:

8121310 Ornamental Horticulture 1
8121320 Ornamental Horticulture 2
8121330 Ornamental Horticulture 3
8121010 Floriculture 1
8121020 Floriculture 2
8121030 Floriculture 3

CURRICULUM FRAMEWORK
FLORIDA DEPARTMENT OF EDUCATION

PROGRAM AREA: Agriculture
EFFECTIVE DATE: July, 1989

PROGRAM TITLE: Floriculture

CODE NUMBER: Secondary 8121000 Postsecondary ORV0110
Florida CIP 0101.060300

SECONDARY SCHOOL CREDITS: 6 COLLEGE CREDITS: ____
POSTSECONDARY ADULT VOCATIONAL CREDITS: ____

APPLICABLE LEVELS: ___ 7-9 ___ 9-12
___ Postsecondary Vocational
___ Postsecondary Adult Vocational ___x___ Other 10-12, 30, 31

CERTIFICATION COVERAGE:	10-12, 30, 31	VOC AGRI @4 HORTICULT #7	AGRI @4 AGRICULTUR I, 2
	30, 31	VOC AGRI @4 HORTICULT 7	AGRI @2, @4 AGRICULTUR I, 2

I. **Major Concepts/Content.** The purpose of this program is to prepare students for employment as greenhouse superintendents (405.131-010); plant propagators (405.361-010); horticultural workers II (405.687-014); supervisors, horticultural-specialty farming (405.131-010); or to provide supplemental training for persons previously or currently employed in these occupations.

The content includes, but is not limited to, instruction that prepares individuals to produce flowers, foliage, and related plant materials in fields and greenhouses for ornamental purposes, and to arrange, package, and market these materials. Subject matter also includes preparation of planting media, propagation, pruning, irrigation, disease and insect control, harvesting, marketing, maintenance and operation of equipment, as well as employability, communication, and human relations skills.

Listed below are the courses that comprise this program when offered at the secondary level:

8121010 Floriculture 1
8121020 Floriculture 2
8121030 Floriculture 3
8121040 Floriculture 4
8121050 Floriculture 5
8121060 Floriculture 6

II. **Laboratory Activities.** Agricultural shop and floricultural laboratory activities are an integral part of this program, including the safe use of mechanics' hand tools, field hand tools, hand and portable power carpentry tools, arc welders, oxyacetylene torches, tractors and field equipment, irrigation equipment, chemical applicators, and sprayers.

III. **Special Note.** Future Farmers of America (secondary) and the National Postsecondary Agricultural Student Organization (postsecondary) are the appropriate vocational student organizations for providing leadership training and for reinforcing specific vocational skills. When provided, these activities are considered an integral part of this instructional program.

Planned and supervised occupational activities must be provided through one or more of the following: (1) directed laboratory experience, (2) student projects, (3) placement for experience, (4) cooperative experience.

Because of the production and marketing cycle of the floriculture industry, this program requires individual instruction and supervision of students for the entire period beyond the 180-day school year.

The cooperative method of instruction is appropriate for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan, signed by the student, teacher, and employer, which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills, and tasks which are relevant to the occupation which the student has chosen as a career goal. The student must receive compensation for work performed.

III. **Special Note.** In accordance with Section 233.0695, F.S., the minimum basic skills grade level required for this postsecondary adult vocational program is: Mathematics 6.0, Language 7.0. This grade level number corresponds to a grade equivalent score obtained on a state-designated basic skills examination.

The typical length of this program for the average achieving student is 900 hours.

The particular outcomes and student performance standards which the handicapped student must master to earn credit must be specified in the student's individual educational plan (IEP). Additional credits may be earned when outcomes and standards are mastered in accordance with the requirements indicated in subsequent IEPs. The job title for which the student is being trained must be designated in the IEP.

IV. **Intended Outcomes.** After successfully completing this program, the student will be able to:

01. Demonstrate an understanding of the horticulture industry.
02. Describe plant physiology and growth.
03. Identify and classify plants.
04. Propagate plants.
05. Identify growing media and apply fertilizers.

06. Irrigate plants and turfs.
07. Control pests.
08. Demonstrate pruning skills.
09. Harvest, transport, and install plant materials.
10. Operate, repair, and maintain tools and equipment.
11. Keep records.
12. Demonstrate employability skills.
13. Prepare growing media and seedbeds.
14. Propagate plant materials.
15. Control plant growth by cultural, environmental, and chemical methods.
16. Irrigate plants.
17. Harvest, store, package, and ship floriculture materials.
18. Market floriculture materials.
19. Operate, repair, and maintain floriculture equipment and facilities.
20. Fertilize plant materials.
21. Control plant pests.
22. Maintain and analyze records.

STUDENT PERFORMANCE STANDARDS EFFECTIVE DATE: July, 1989

PROGRAM AREA: Agriculture SECONDARY NUMBER: 8121000

PROGRAM TITLE: Floriculture POSTSECONDARY NUMBER: ORV0110

01.0 DEMONSTRATE AN UNDERSTANDING OF THE HORTICULTURE INDUSTRY--The student will be able to:

- 01.01 Identify fields of endeavor.
- 01.02 Describe economic importance.
- 01.03 Describe environmental importance.
- 01.04 Identify employment opportunities.
- 01.05 Describe regulatory aspects.
- 01.06 Identify continuing education opportunities.
- 01.07 Identify professional organizations and trade journals in the horticulture industry.

02.0 DESCRIBE PLANT PHYSIOLOGY AND GROWTH--The student will be able to:

- 02.01 Describe woody and herbaceous plants.
- 02.02 Identify parts of the plant.
- 02.03 Describe the process of photosynthesis.
- 02.04 Describe the basic functions of roots, stems, and leaves.
- 02.05 List the requirements for healthy plant growth.
- 02.06 Identify taproot and fibrous root systems.
- 02.07 Identify the difference between evergreen and deciduous plants.

03.0 IDENTIFY AND CLASSIFY PLANTS--The student will be able to:

- 03.01 Classify plants as monocots or dicots.
- 03.02 Identify plants according to scientific and common name.
- 03.03 Classify plants as annuals, biennials, and perennials.
- 03.04 Identify plants appropriate to a region.
- 03.05 List environmental preference of plants (shade, sun, wind, moisture, salt, etc.).
- 03.06 Classify plants according to growth habit.

04.0 PROPAGATE PLANTS--The student will be able to:

- 04.01 Identify asexual and sexual plant propagation methods.
- 04.02 Prepare propagation media.
- 04.03 Select and collect propagation materials.
- 04.04 Demonstrate propagation by seeding, grafting, budding, layering, separation, division, and cutting.
- 04.05 Demonstrate environmental controls for propagation materials (moisture, temperature, light).
- 04.06 Transplant rooted propagation materials.
- 04.07 Identify propagating and growing facilities and structures.

05.0 IDENTIFY GROWING MEDIA AND APPLY FERTILIZERS--The student will be able to:

05.01 Identify soil and media materials.
05.02 Identify types and kinds of fertilizers.
05.03 Identify methods of distributing fertilizers.
05.04 Interpret analysis of fertilizer from information on tag or container.
05.05 Identify symptoms of nutritional deficiencies of plants.
05.06 Collect a soil sample for soil analysis.
05.07 Determine fertilization requirements of plant materials.
05.08 Determine a fertilizer schedule.
05.09 Apply fertilizer and soil amendments.
05.10 Apply special fertilization methods appropriate to a region or plant group.
05.11 Determine rate of fertilizer applications.
05.12 Recognize symptoms of fertilizer burn.
05.13 Clean and store fertilizer application unit.
05.14 Maintain fertilization records.

06.0 IRRIGATE PLANTS AND TURFS--The student will be able to:

06.01 Identify water needs of plants.
06.02 Identify irrigation components and types of systems.
06.03 Identify sources of water for irrigation.
06.04 Install irrigation systems with control valves and clocks.
06.05 Install drainage system and identify drainage components for different types of drainage systems.
06.06 Irrigate plants.
06.07 Repair irrigation systems.

07.0 CONTROL PESTS--The student will be able to:

07.01 Classify insects according to feeding habits.
07.02 Identify common insects and diseases of plants.
07.03 Describe life cycle of insect pests and diseases.
07.04 Describe methods (biological, chemical, and cultural) of controlling plant insects and diseases.
07.05 Report insect and disease damage.
07.06 Interpret information on a pesticide or agricultural chemical label.
07.07 Interpret and use spray compatibility chart.
07.08 Comply with local, state, federal, and EPA regulations regarding pesticide use.
07.09 Select, mix, and apply pesticides according to the product label.
07.10 Clean, adjust, and calibrate spray equipment.
07.11 Store and dispose of pesticide containers legally.
07.12 Maintain pesticide records.
07.13 Describe symptoms of pesticide poisoning and identify first aid required.
07.14 Determine appropriate time to apply chemicals.
07.15 Select and identify pesticides according to controlling action (stomach, contact, systemic).

08.0 DEMONSTRATE PRUNING SKILLS--The student will be able to:

08.01 Identify methods of pruning plants to achieve desired growth and maintain health.
08.02 Identify and select pruning tools for the task.
08.03 Identify appropriate time to prune plants.
08.04 Root-prune appropriate plants.
08.05 Prune plants for desired shape and growth.
08.06 Identify and select chemical growth regulators.
08.07 Identify means of sterilizing pruning tools.

09.0 HARVEST, TRANSPORT, AND INSTALL PLANT MATERIALS--The student will be able to:

09.01 Select and prepare field-grown and container plants for transportation and transplanting.
09.02 Determine requirements for preserving plant viability.
09.03 Install ornamental plants per a landscape plan.

10.0 OPERATE, REPAIR, AND MAINTAIN TOOLS AND EQUIPMENT--The student will be able to:

10.01 Identify, operate, and maintain small gasoline engines.
10.02 Identify, operate, and maintain hand tools and power tools.
10.03 Perform equipment preoperational check before use.
10.04 Identify, operate, and maintain tractor and power equipment.
10.05 Load, secure, and transport equipment.
10.06 Demonstrate safety precautions while working with tools and equipment.

11.0 KEEP RECORDS--The student will be able to:

11.01 Keep fertilizer and pesticide application records.
11.02 Keep equipment maintenance and service records.
11.03 Keep job records, daily log sheets, and inventory.

12.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

12.01 Conduct a job search.
12.02 Secure information about a job.
12.03 Identify documents that may be required when applying for a job.
12.04 Complete a job application form correctly.
12.05 Demonstrate competency in job interview techniques.
12.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
12.07 Identify acceptable work habits.
12.08 Demonstrate knowledge of how to make job changes appropriately.
12.09 Demonstrate acceptable employee health habits.

13.0 PREPARE GROWING MEDIA AND SEEDBEDS--The student will be able to:

13.01 Mix rooting and growing media according to plan requirements.
13.02 Sterilize rooting, potting, and growing media.

13.03 Collect and test a soil sample from field and potting media.
13.04 Adjust pH and nutritional levels of media.
13.05 Prepare planting beds and sites.
13.06 Fill and level benches and pots with media.
13.07 Demonstrate sanitation practices when handling and storing plant media materials.
13.08 Construct and repair drainage ditches in field growing area.

14.0 PROPAGATE PLANT MATERIALS--The student will be able to:

14.01 Collect propagation materials (seeds, cuttings, scions, bulbs, etc.) at proper time.
14.02 Demonstrate propagation by grafting, budding, layering, separating, dividing, cutting, and tissue culture.
14.03 Prepare flats and seedbeds, and plant seeds.
14.04 Prepare a rooting bed.
14.05 Prepare propagation materials (seeds, cuttings, scions, etc.) for planting.
14.06 Apply growth stimulants to propagation materials.
14.07 Control propagation facility environment (moisture, temperature, light).
14.08 Transplant rooted propagation materials, including tissue culture transplants.
14.09 Demonstrate sanitation and safety practices when propagating.

15.0 CONTROL PLANT GROWTH BY CULTURAL, ENVIRONMENTAL, AND CHEMICAL METHODS--The student will be able to:

15.01 Pinch and disbud flowering plants.
15.02 Apply growth-regulating chemicals.
15.03 Install black cloth to regulate photoperiod.
15.04 Apply shading compound to greenhouse structure.
15.05 Prune plants to achieve desired growth.

16.0 IRRIGATE PLANTS--The student will be able to:

16.01 Identify and use various types of irrigation components and systems.
16.02 Set up irrigation system for propagation area.
16.03 Set up irrigation system for greenhouse or enclosed structure.
16.04 Set up irrigation system for shadehouse.
16.05 Set up irrigation system for retail display area.
16.06 Set up irrigation system for field growing area.

17.0 HARVEST, STORE, PACKAGE, AND SHIP FLORICULTURE MATERIALS--The student will be able to:

17.01 Select, grade, and assemble floriculture materials.
17.02 Cut, count, and bunch cut flowers and other plant materials.
17.03 Prepare for shipment, loading, and transporting harvested plant materials.
17.04 Use proper methods to preserve plant viability.
17.05 Demonstrate safety practices when harvesting, processing, and shipping nursery stock.

18.0 MARKET FLORICULTURE MATERIALS--The student will be able to:

18.01 Label and merchandise floriculture materials.
18.02 Maintain clean and attractive merchandising and display areas.
18.03 Use various advertising methods to promote sales.
18.04 Take telephone orders.
18.05 Use sales catalog.
18.06 Greet customers.
18.07 Describe care and use of product to customers.

19.0 OPERATE, REPAIR, AND MAINTAIN FLORICULTURE EQUIPMENT AND FACILITIES--The student will be able to:

19.01 Determine equipment needs for the job.
19.02 Clean, calibrate, and maintain chemical sprayers.
19.03 Operate and service tractors, small gasoline engines, and power equipment.
19.04 Maintain electric motors and equipment.
19.05 Order parts and supplies.
19.06 Prepare and store equipment.
19.07 Perform simple plumbing and electrical repairs.
19.08 Build or repair frames, benches, and other greenhouse or field structures.

20.0 FERTILIZE PLANT MATERIALS--The student will be able to:

20.01 Identify and evaluate influences of nutrients on plant growth.
20.02 Collect soil and leaf-tissue samples for analysis.
20.03 Interpret and evaluate the results of soil and leaf-tissue analysis.
20.04 Apply fertilizers using appropriate methods (dry, liquid, slow-release, injection, etc.).
20.05 Demonstrate proper handling and storage of fertilizers, observing safety precautions.

21.0 CONTROL PLANT PESTS--The student will be able to:

21.01 Identify plant diseases, symptoms, and causal agents.
21.02 Identify insect and insectlike damage and causal agents.
21.03 Identify noxious weeds.
21.04 Select proper controls (biological, chemical, and cultural) for insects, diseases, and weeds.
21.05 Determine appropriate time, frequency, method, and amount of application of controls.
21.06 Apply controls safely.
21.07 Identify pesticide, herbicide, and chemical spray damage.
21.08 Comply with local, state, and federal pesticide regulations.
21.09 Identify vertebrate damage and causal agents.

22.0 MAINTAIN AND ANALYZE RECORDS--The student will be able to:

22.01 Analyze and maintain production and sales records.
22.02 Determine plant production costs.
22.03 Prepare a budget.

22.04 Prepare and maintain financial records.
22.05 Maintain current plant inventory.
22.06 Describe the use of a computer in the operation.

FACILITIES

This section includes facility design criteria and a list of suggested equipment and supplies.

Design Criteria

Florida State Board of Education Rule 6A-2.032 specifies the amount of space and occupant design criteria that school districts must follow in planning and designing facilities for the Floriculture program. However, the program guide committee recommended the following minimum, normal, and maximum sizes for a one-time occupancy design capacity of twenty students.

Program Facility	Minimum (sq. ft.)	Normal (sq. ft.)	Maximum (sq. ft.)
Office Space per Instructor	100	150	200
Floriculture Laboratory	960	1,000	1,040
Classroom (related instruction)	500	525	550
Greenhouse	3,500	4,200	5,000
Lockers and Toilets	140	150	160
Reference	190	200	210
Storage, Flammable	165	175	185
Storage, Materials	400	600	800
Storage, Tools and Equipment	1,000	1,500	2,000
Storage, Pesticides	330	350	370
Walk-in Cooler	80	90	100

Exterior Space

Two to three acres
1,200-square-foot exterior concrete slab, fenced and covered
1,600-square-foot shadehouse

Specific Provisions

The floriculture/horticulture program area should be an integral part of the total program of a school. Therefore, considerable thought and careful study should be given to locating the department, of which the Floriculture program is a part. Some of the factors that should be considered are:

The department should be easily accessible.
The department should have a sufficient number of parking spaces.
The shop should be located and designed so that it avoids disturbing the other classes.
Facilities should have adequate heating and cooling.
Facilities should be located at ground level and have good drainage.
The laboratory and classroom should be adjacent to each other.
The office space and reference space should be a separate facility within the floriculture/horticulture complex.

Classroom Facilities

The following are some of the suggested facilities for the classroom:

Acoustic ceiling
Adequate duplex electrical outlets (at least four)
Adjustable shelves
Display racks for reference books and periodicals
Heating and air conditioning
Lockable cabinet for teacher use
Lockable storage cabinets
Minimum of 18 lineal feet of 36-inch chalkboard
Minimum of 32 square feet of tackboard
Operable windows with shades for light control
Rheostat lighting control
Tilt wall-mounted screen for audiovisual use
Wall clock

Laboratory Facilities

The following are some of the recommended specifications for the laboratory:

Adequate heating and cooling
Adequate lighting
Adequate windows for lighting and ventilation
Drafting tables
Lockable metal cabinets for storage
Master electrical control switch
Metal storage shelves
Minimum of 24 square feet of tackboard
Overhead doors at least 12 feet high
Pesticide storage with sump and ventilation
Separate restrooms for men and women
Sufficient 120-volt outlets for small equipment
Sufficient 240-volt power outlets for heavy-duty equipment
Tool and equipment storage facilities
Wall clock
Walls and ceilings at least 14 feet high
Washing and drinking facilities
Work benches and tables

Suggested Equipment and Supplies

The following are some of the suggested equipment:

Auger bit sets
Battery charger
Bench, welding
Brace-rachet set
Carts, greenhouse (with pneumatic tires)
Chisel set, wood
Compressor, air
Cutter, pipe
Cutter, sod
Basket, wire
Bench, potting
Boots, protective
Buckets, water
Caulking guns
Clippers, hedge (electric)
Containers, gasoline (two 1/2-gallon)
Cutter, tubing

Dial, probe-type (to 200° F)
Drafting sets
Drive socket, 1/4-inch x 3/8-inch
Edgers, cement (curved-blade)
Fertilizer spreader, shoulder-carry (Cyclone)
Flaring tool, copper
Forks, spading and manure
Funnels, utility
Gloves, protective
Goggles, clear-plastic
Greenhouse/shadehouse
Grinder, 7-inch
Grinding dressers, abrasive
Hammers, ballpeen
Hammers, sledge-
Hand truck
Harrow, disc (with 3-point hitch)
Heating cable with thermostat, electric
Hoes
Hooks, bush
Jack, hydraulic (Come-along)
Lenses, hand
Levels, carpenter's line
Mist system, automatic
Mower, rotary (21-inch push-type gasoline-powered)
Planting bars (dibbles)
Pliers set
Pot grips
Propane torch kit
Railroad picks
Rakes, grading
Respirators
Ripsaws, hand
Saw, chain
Saws, crosscut (hand)
Scale, ounce (spring)
Scraper, box (3-point hitch)
Seeder, precision (push-type)
Seed germinator, 300-watt
Shader, box (3-point hitch)
Shades (for room light control)
Shears, can
Shears, lopping
Shovels, round-point
Shredder, soil
Skid steer
Soil samplers, tube
Soldering kit
Sprayer, paint
Sprayers, herbicide (2-gallon stainless steel)
Spreader, push-type (Cyclone)
Diggers, posthole
Drills, 3/8-inch (portable)
Duster, rotary (hand-cranked)
Extension cords
File sets
First-aid kits
Flaring tool sets
Framing squares
Garbage cans for storage (plastic)
Grafting tools
Greenhouse sprayer, electric (25-gallon)
Hacksaws
Hammers, claw
Handsaw, electric
Hard hats, protective
Hatchets
Helmets, safety
Hoist, chain
Hoses, water (50-foot)
Ladder, extension
Level, farm (with tripod)
Lifting straps
Mixer, concrete
Overalls, protective (disposable)
Pin bars, lifting
Pliers
Plumb bob
Press, drill
Punches, can
Rakes, garden
Reamer, pipe
Respirators, mask
Rules, bench
Saw, 10-inch radial arm table
Saws, pruning
Scale, pound (spring)
Screwdriver sets
Seed flats
Shade cloth, black (2,600-square-foot)
Sharpening stones
Shears, hedge
Shears, pruning
Shovels, square-point
Sieve, hand
Soil augers
Soil sterilizer
Spades
Sprayers, herbicide (hand)
Sprayers, insecticide (2-gallon stainless steel)
Squares, combination

Stepladder
Tapes, steel (100-foot)
Thermometers, greenhouse (nonmercury)
Thermometer, soil
Tiller, soil
Time clock, 24-hour
Timer, interval
Tractor, with turf-type tires (30-horsepower)
Vacuum, shop
Water nozzles, Fog-it
Welder, oxyacetylene
Wrenches, pipe (10-, 14-, and 24-inch set)
Wrench sets, adjustable

Stereomicroscopes with light and cases
Thermometers, high/low recording
Time clock, fast-cycle (adjustable for mist control)
Tractor, garden
Trowel
Trowel set
Vises, machinist
Welder, arc (electric)
Wheelbarrows, contractor-type
Wrench set, box-end

PROGRAM IMPLEMENTATION

This section includes information that may aid the instructor in planning the implementation of the Floriculture program: student admission requirements, a list of safety manuals, an explanation of the components of a student learning guide, cooperative training, and student organization participation.

Student Admission Requirements

In accordance with the Course Code Directory, the Floriculture program is offered to students at grade levels 10-12, 30, and 31. There are no specific student admissions criteria other than those that may be required by local education agencies.

Safety and Maintenance

As a Floriculture instructor, you should follow the general rules for safety included in the Florida Vocational Education Program Implementation Guide. Also, you should refer to safety manuals specific to Agribusiness and Natural Resources Education such as:

Applying Pesticides
Developing Shop Safety Skills
Safety Color Coding for the Shop
American Association for Vocational Instructional Materials (AAVIM)
120 Driftmier Engineering Center
Athens, Georgia 30602

Florida Vocational Agriculture Safety Manual
Department of Agriculture and Extension Education
College of Agriculture
University of Florida
Gainesville, Florida 32611

Aerial Applicator
Agricultural Pest Control Manual
Applying Pesticides Correctly
Florida Cooperative Extension Services
Institute of Food and Agricultural Sciences
University of Florida
Gainesville, Florida 32611

Safety Instruction Manual for Programs in Agriculture Education
Bureau of Agricultural Education
New York State Department of Education
1 Commerce Plaza, Room 1619
Albany, New York 12234

For further information about safety manuals, contact the Instructional Materials Service, College of Agriculture, 305 Rolfs Hall, University of Florida, Gainesville, Florida 32611, (904) 372-0502, SUNCOM 622-0502.

Student Learning Guide

As mentioned in Instructional Approach of Florida Vocational Education Program Implementation Guide, competency-based vocational instruction (CBVI) is the most appropriate instructional approach to teaching students to become competent in Floriculture. In order to implement CBVI effectively and efficiently, you and the students should have access to competency-based instructional materials, such as student guides or modules.

A sample student learning guide is provided in the Appendix of this program guide as an example for you to use when developing or adapting a set of learning guides or modules. This sample guide is not complete--it presents basic components of a competency-based student learning guide: an introduction, objectives, a list of resources, learning activities, information sheets, a self-check and answer sheet, an activity sheet, a written test, and a performance test. An answer key to the written test is included in the instructor version of the learning guide.

The following components are often included in a student learning guide:

The **introduction,** which includes the intended outcome, the SPS for which the guide is developed, and an introduction to the guide stating why this topic is important to study and what this guide is about (Other information, such as the relationship between this guide and other guides, can also be included on this sheet.)

The **objectives,** which include both knowledge and performance objectives if the SPS calls for hands-on performance, but only knowledge objectives if the SPS requires knowledge-oriented competencies

The **list of resources,** which includes instructional materials the students should use to study and tools and supplies students should have access to in order to complete this guide

The **learning activities,** which include a list of steps students should take in order to master the objectives

An **information sheet,** which may need to be developed if the existing instructional materials do not cover enough content for students to master the objectives

The **self-check,** which consists of questions designed to help students review what they have studied (This is followed by an answer sheet.)

The **activity sheet,** which is designed to help students practice hands-on tasks for the performance objective(s) (If the SPS does not require hands-on activity, this sheet is not included in the learning guide.)

The **written test,** which is to measure the student's achievement on the knowledge objectives

The **performance test,** which is designed to be used by the instructor/evaluator to assess the student's level of achievement on the performance objective(s)

The student learning guide may consist of two or more sets of the above components if the objectives need to be divided into two or more groups. Whatever format you use for the student learning guide, these components should be included in order to incorporate instructional events such as

1. gaining attention
2. stating objectives
3. recalling prerequisites
4. providing instructional stimulus
5. providing learning guidance
6. eliciting performance
7. providing feedback
8. assessing performance
9. enhancing retention and transfer.

Cooperative Training

Cooperative on-the-job training (OJT) for Floriculture may be taken by a student for one or more semesters. The specific student performance standards that the student should master to earn credit must be specified in the OJT training plan. This plan should include a list of OJT and in-school learning experiences and should be signed by the student, instructor, employer, and cooperative program coordinator. Besides the training plan, each student should have access to a work station with relevant tools and equipment that can facilitate the student's mastery of skills and knowledge necessary for the student to function as a beginning worker in the floricultural business and industry.

The teacher-coordinator must visit each job site **at least** once during each grading period for the purpose of evaluating the student's progress in attaining the competencies listed in the training plan.

The student must receive compensation for work performed on the job and may earn multiple credits.

For additional information on cooperative training, refer to the Suggested Guidelines for Cooperative Agribusiness Programs in Florida, which should be available through the regional offices of the Division of Vocational, Adult, and Community Education.

Student Organization Participation

The two vocational student organizations associated with the Floriculture program are Future Farmers of America (FFA) for secondary students and the National Postsecondary Agricultural Student Organization (postsecondary).

FFA began early in the history of vocational education as instructors became aware of the need to provide practical training beyond the traditional classroom approach. Instruction was made more interesting through incorporating practical work experience, competitive judging events, and leadership development activities into the program. This learn-by-doing principle, the foundation of FFA, became the vehicle for providing leadership training and occupational incentive.

FFA provides leadership opportunities by challenging students with incentive awards and activities that are specifically designed to be a part of the instructional program. Members learn through active participation how to conduct and take part in public meetings, how to speak in public, and how to take leadership roles in their schools and communities. These activities encourage entrepreneurship, help make better employees, and develop responsible citizens by uniting them with leadership opportunities in agriculture and agribusiness.

Participation in FFA helps develop a sense of responsibility, the ability to work cooperatively, fairness, and an increased knowledge of agribusiness.

PROFESSIONAL DEVELOPMENT

Teacher Standards and Technical Updating

Certification

Listed below are the certification coverages included in the current Course Code Directory for Agribusiness and Natural Resources Education.

10-12, 30, 31	VOC AGRI @4 HORTICULT #7	AGRI @4 AGRICULTUR 1, 2
30, 31	VOC AGRI @4 HORTICULT 7	AGRI @2, @4 AGRICULTUR 1, 2

Other Qualifications

Local education agencies may qualify the instructor to teach vocational agriculture by having fulfilled one or more of the following requirements:

1. The teacher has obtained a regular or temporary Florida teacher's certificate with appropriate coverages.
2. The teacher has been approved by the local school board, in accordance with official school policy.
3. The teacher holds a regular or temporary Florida teacher's certificate with other than appropriate coverage, but has met all occupational experience requirements for appropriate certification and has been approved by the local school board to teach out of field.

Community college instructors should meet the requirements of the individual college.

Technical Updating

For technical and professional updating inservice activities, instructors at high schools and area vocational-technical centers should contact the district Teacher Education Center (TEC) and Agricultural Education supervisors. Community college instructors should contact the department of Program and Staff Development of the individual college.

Professional Organizations and Support Services

All-America Rose Selections
P. O. Box 218
Shenandoah, IA 51601

American Association of Nurserymen
1250 I Street, NW, Suite 500
Washington, DC 20005

American Horticultural Society
P. O. Box 0105
Mt. Vernon, VA 22121

American Nurseryman
310 S Michigan Avenue
Chicago, IL 60604

American Rose Foundation
P. O. Box 30000
Shreveport, LA 71130

American Sod Producers Association
4415 W Harrison Street
Hillside, IL 60162

BPI, A Growers Organization
P. O. Box 286
Okemos, MI 48864

Florida Flower Association
P. O. Box 1569
Ft. Myers, FL 33902

Florida Nursery Growers Association
5401 Kirkman Road, Suite 650
Orlando, FL 32819

Garden Industry of America
P. O. Box 1092
Minneapolis, MN 55440

Horticulture Awareness Association
14575 Mercury Drive
Grand Haven, MI 49417

The Irrigation Association
1911 N Fort Myer Drive, Suite 1009
Arlington, VA 22209

Landscape Nursery Council
28E Rahn Road
Dayton, OH 45429

National Equipment Servicing
Dealers Association
Box 121, E Main Street
Jefferson Valley, NY 10535

National Lawn and Garden
Distributors Association
1900 Arch Street
Philadelphia, PA 19103

North American Gladiolus Council
Commercial Growers Division
5007 60th Street, E
Bradenton, FL 34203

American Society of Agronomy
677 S Segoe Road
Madison, WI 53711

Associated Landscape Contractors
of America
405 N Washington Street
Falls Church, VA 22046

The Fertilizer Institute
1015 18th Street, NW
Washington, DC 20036

Florida Foliage Association
P. O. Box Y
Apopka, FL 32703

Florida Turfgrass Association
302 S Graham Avenue
Orlando, FL 32803-6332

Horticultural Research Institute
1250 I Street, NW, Suite 500
Washington, DC 20005

International Garden Horticultural
Industry Association
26 Pine Street
Dover, DE 19901

Landscape Maintenance Association
P. O. Box 728
Largo, FL 34649

National Association of Plant Patent
Owners
1250 I Street, NW, Suite 500
Washington, DC 20005

National Landscape Association
1250 I Street, NW, Suite 500
Washington, DC 20005

North American Flowerbulb
Wholesalers Association
P. O. Box 581
Middletown, NJ 07748

Nursery Association Executives
P. O. Box 1871
Bozeman, MT 59771

Nursery Marketing Council
1250 I Street, NW, Suite 500
Washington, DC 20005

Outdoor Power Equipment Institute
1901 L Street, NW, Suite 700
Washington, DC 20036

Planting Council
119B Great Road
Bedford, MA 01730

Roses Incorporated
1152 Haslett Road
Haslett, MI 48840

Southern Florist and Nurseryman
Reader Service Department
Box 1868
Fort Worth, TX 76101

Wholesale Nursery Growers of America
1250 I Street, NW, Suite 500
Washington, DC 20005

Outdoor Power Equipment Distributors Association
1900 Arch Street
Philadelphia, PA 19103

Perennial Plant Association
217 Howlett Hall
2001 Fyffe Court
Ohio State University
Columbus, OH 43210

Professional Lawn Care Association of America
1225 Johnson Ferry Road, Suite B-220
Marietta, GA 30067

Society of American Florists
1601 Duke Street
Alexandria, VA 22314

Wholesale Florists and Florist Suppliers of America
5313 Lee Highway
Arlington, VA 22207

INSTRUCTIONAL RESOURCES

This section lists print, audiovisual, and computer software resources. Resource materials have been identified by Florida Educational Information Service and the committee members but have not been reviewed for their quality. Additional instructional materials may be obtained from the sources listed at the end of this section.

Print Materials

Agricultural Occupations. Education for Employment Task Lists. Grayslake, Ill.: Lake County Area Vocational Center; Springfield: Illinois State Board of Education; 1986.

Albracht, James, ed. Basic Core Curriculum Project: Horticulture I, II, and III. Pittsburg, Kans.: Pittsburg State University, 1982.

Architectural Drafting Curriculum Guide. Michigan Trade and Industrial Education. East Lansing: Michigan State University; Lansing: Michigan State Department of Education; 1984.

Ball, Vic, ed. The Ball Red Book. 14th ed. Englewood Cliffs, N.J.: Reston Publishing Co., 1984.

Barnard, Edward L., and Dixon, Wayne N. Insects and Diseases: Important Problems of Florida's Forest and Shade Tree Resources. Tallahassee, Fla.: Florida Department of Agriculture and Consumer Services, 1983.

Baudendistel, Robert F. Horticulture: A Basic Awareness. 2nd ed. Englewood Cliffs, N.J.: Reston Publishing Co., 1982.

Be a Building Watcher on the Street Where You Live. Indianapolis: Historic Landmarks Foundation of Indiana, 1986.

Bender, Gerald F., and Probasco, Jack F. "Include Passive Solar in Your Renovations." American School and University 53 (April 1981): 38, 40-42.

Bingaman, Charles E., ed. Florida Certified Nursery Professional Manual. Orlando: The Florida Nurserymen and Growers Association, 1984.

Biondo, Ron, et al. Core II Materials for Metropolitan Agriculture/Horticulture Programs, Units G-L. Urbana: University of Illinois; Springfield: Illinois State Board of Education; 1982.

Biondo, Ron, et al. Core III Materials for Metropolitan Agriculture/Horticulture Programs, Units J-M. Urbana: University of Illinois; Springfield: Illinois State Board of Education; 1982.

Boodley, James W. The Commercial Greenhouse. Albany, N.Y.: Delmar Publishers, 1981.

Brickman, Dick. "How to Cut Landscape Maintenance Costs." American School and University 54 (June 1982): 28-33.

Career Preparation for Agriculture/Agribusiness. Hightstown, N.J.: McGraw-Hill Book Co., 1980.

Compact Tractor Service Manual. 2nd ed. Overland Park, Kans.: Intertec Publishing, 1986.

A Comprehensive Horticulture Curriculum Guide for New Jersey Schools. New Brunswick, N.J.: Rutgers, The State University; Trenton: New Jersey State Department of Education; 1985.

Designing the Landscape. Columbus: Ohio Agricultural Education Curriculum Materials Service, 1980.

Developing a Landscape Plan. Agricultural Occupations Curriculum. Springfield: Illinois State Board of Education, 1981.

Dig Manual: A Guide to the Identification and Selection of Florida Ornamental Plants. Tallahassee: State of Florida, 1984.

Furuta, Tokuji. Interior Landscaping. Englewood Cliffs, N.J.: Reston Publishing Co., 1982.

Geer, Barbara Farabough. Basic Horticulture. Stillwater, Okla.: Oklahoma State Department of Vocational and Technical Education, 1981.

Gould, Bryant, and Finci, David. "Site Plan: A First Step." American School and University 58 (April 1986): 60, 62, 64, 66.

Grades and Standards for Nursery Plants, Part 1. 3rd ed. Gainesville: Florida Department of Agriculture and Consumer Services, 1973.

Grades and Standards for Nursery Plants, Part 2: Palms and Trees. Gainesville: Florida Department of Agriculture and Consumer Services, 1965.

Graf, Alfred B. Pictorial Cyclopedia of Exotic Plants. Exotica Series IV International. East Rutherford, N.J.: Roehrs Co., 1985.

Graf, Alfred B. Tropica: Color Encyclopedia of Exotic Plants. 3rd ed. East Rutherford, N.J.: Roehrs Co., 1986.

A Guide to Safe Pest Control around the Home. Ithaca, N.Y.: New York State College of Agriculture and Life Sciences, 1979.

Hemp, Paul, et al. Core IV Materials for Metropolitan Agriculture/Horticulture Programs. Urbana: University of Illinois; Springfield: Illinois State Board of Education; 1984.

Hill, Lewis, ed. Pruning Simplified. Pownal, Vt.: Storey Communications, 1986.

Holmes, Francis W. "How to Get Trees." American School and University 53 (April 1981): 40f.

Horticultural Competency Worksheets. St. Paul: Hobar Publications, n.d.

Horticulture: Landscape. Lansing: Michigan State Board of Education, 1985.

Hudson, Coy L. Horticulture Technology: A Competency-based Curriculum Manual. Raleigh: North Carolina Department of Community Colleges, 1979.

Implementing the Landscape Plan. Agricultural Occupations Curriculum. Springfield: Illinois State Board of Education, 1981.

Improvement of School Climate. Ridgecrest, Calif.: Sierra Sands Unified School District, 1984.

Ingels, Jack E. Landscaping: Principles and Practices. 2nd ed. Albany: Delmar Publishers, 1983.

Ingels, Jack E. Ornamental Horticulture: Principles and Practices. Albany: Delmar Publishers, 1985.

Ingvalson, Brian I. Competency-based Horticulture: Student Handbook and Planning Guide. Forest Lake, Minn.: Karen Ann Publishing Co., 1977.

Janick, Jules. Horticultural Science. New York: Freeman and Company, 1986.

Jensen, Delores. Resource Book for Vocational Programs for Mentally Handicapped Adults. Kelowan, B.C.: Okanagan College; Victoria: British Columbia Department of Education; 1985.

Lamberth, Edwin E. Technical Competencies in Greenhouse Management and Landscape Design Needed by High-School Teachers of Vocational Horticulture in Tennessee. Research Report Series No. 5. Cookeville: Tennessee Technological University, 1983.

Landscape Plant Identification. Rev. ed. College Station: Texas A & M University, 1975.

Lawn, Garden, and Power Equipment Owner's Manual. Overland Park, Kans.: Intertec Publishing, 1985.

Legacy, Jim, et al. Competency-based Teaching Materials in Horticulture: Developing a Landscape Plan. Carbondale: Southern Illinois University, 1980.

Legacy, Jim, et al. Competency-based Teaching Materials in Horticulture: Implementing the Plan. Carbondale: Southern Illinois University, 1980.

Legacy, Jim, et al. Competency-based Teaching Materials in Horticulture: Maintaining Landscapes. Carbondale: Southern Illinois University, 1980.

Legacy, Jim, et al. Competency-based Teaching Materials in Horticulture: Nursery Propagation. Carbondale: Southern Illinois University, 1980.

Legacy, Jim, et al. Competency-based Teaching Materials in Horticulture: Planting Turf. Carbondale: Southern Illinois University, 1980.

Legacy, Jim, et al. Competency-based Teaching Materials in Horticulture: Soils and Fertilizers. Carbondale: Southern Illinois University, 1980.

Legacy, Jim, et al. Competency-based Teaching Materials in Horticulture: Tree Identification. Carbondale: Southern Illinois University, 1980.

Libby, Thomas J. "Reclaiming Our Turf." School Arts 79 (May 1980): 10-12.

Lindley, Charles. "Enhancement through Landscaping." CEFP Journal 23 (July-August 1985): 4-7.

Luft, Vernon D., and Backlund, Paul. Introduction to Horticulture, Unit A-10. Fargo: North Dakota State University; Bismarck: North Dakota State Board for Vocational Education; 1981.

Maday, John. Develop and Field Test Written and Performance Student Achievement Measures for Gardening-Groundskeeping and Landscape Operations, Final Report. Gainesville: University of Florida; Tallahassee: Florida Department of Education; 1985.

Manaker, George H. Interior Plantscapes: Installation, Maintenance, and Management. Englewood Cliffs, N.J.: Prentice-Hall, 1981.

Maxwell, Lewis S., and Maxwell, Betty M. Florida Lawns and Gardens. Rev. ed. Tampa: Lewis S. Maxwell, Publisher, 1980.

Maxwell, Lewis S., and Maxwell, Betty M. Florida Plant Selector: A Guide to Choice and Use of Over 100 Landscape Plants. Rev. ed. Tampa: Lewis S. Maxwell, Publisher, 1975.

McDaniel, Gary. Ornamental Horticulture. 2nd ed. Englewood Cliffs, N.J.: Reston Publishing Co., 1982.

McDonald, Sally A. Applying Pesticides Correctly: A Guide for Private and Commercial Applicators. Gainesville: University of Florida, 1984.

The Nursery Worker, Student Manual. Columbus: The Ohio State University, 1984.

O'Banion, B. J. Landscaping Your Home. Columbus: Ohio State University, 1977.

Oregon Agriculture III Curriculum Guide. Corvallis: Oregon State University; Salem: Oregon State Department of Education; 1983.

Perkins, Kent D., and Payne, Willard W. Guide to the Poisonous and Irritant Plants of Florida. Gainesville: University of Florida, 1981.

Pierceall, Greg. Residential Landscapes: Graphics, Planning, and Design. Englewood Cliffs, N.J.: Reston Publishing Co., 1983.

Poisonous Plants of the Southern United States. Gainesville: University of Florida, n.d.

Proceedings of the Annual Southwest Park and Recreation Training Institute (28th). Lubbock: Texas Tech University, 1983.

Reiley, H. Edward, and Shry, Carroll L., Jr. Introductory Horticulture. Albany: Delmar Publishers, 1983.

Richardson, William B., and Moore, Gary. Working in Horticulture. New York: Gregg/McGraw-Hill, 1980.

Riding Lawn Mower Service Manual. 3rd ed. Overland Park, Kans.: Intertec Publishing, 1987.

Rotary Tiller Service Manual. 2nd ed. Overland Park, Kans.: Intertec Publishing, 1985.

Safety Instruction Manual for Programs in Agricultural Education. Albany: New York State Education Department, 1981.

Shry, Carroll L., Jr., et al. "Theme: Staying Current--Horticulture." Agricultural Education Magazine 59 (December 1986): 4-17, 20-23.

Sod Production and Marketing. Des Moines: Iowa Department of Public Instruction; Iowa State University, 1986.

Southwest Park and Recreation Training Institute (27th). Lubbock: Texas Tech University; Arlington, Va.: National Recreation and Park Association; Oklahoma City: Oklahoma State Department of Tourism and Recreation; 1982.

Still, Steven. Herbaceous Plants. Champaign, Ill.: Stipes Publishing Co., 1982.

Turgeon, Al. Turfgrass Management. Englewood Cliffs, N.J.: Reston Publishing Co., 1985.

Urban Horticulture: Scope and Sequence. Nashville: Davidson County Metropolitan Public Schools; Tennessee State Department of Education; 1984.

Walking Lawn Mower Service Manual. 3rd ed. Overland Park, Kans.: Intertec Publishing, 1987.

Ware, George W. Complete Guide to Pest Control, with and without Chemicals. Fresno, Calif.: Thomson Publications, 1980.

Williams, T. Jeff. How to Select, Use, and Maintain Garden Equipment. St. Paul: Hobar Publications, 1981.

Zim, Herbert S., and Martin, Alexander C. Trees: A Guide to Familiar American Trees. Racine, Wisc.: Western Publishing Co., 1956.

Audiovisual Materials

Disease of Landscape Ornamentals. Columbus: Ohio State University, 1985.

Field Wildflowers. Columbus: Ohio State University, 1985.

Herbaceous Ornamental Plants. Columbus: Ohio State University, 1984.

McCann, Kevin. Selected Landscape Plants. Columbus: Ohio State Department of Education; Ohio State University; 1984.

Nursery Landscaping Plant Identification. Columbia: University of Missouri, 1980.

Ornamental Annual Plants and Their Uses. Columbus: Ohio State University, 1985.

Selected Landscape Plants. Columbus: Ohio State University, 1984.

Selected Trees Adaptable to Urban Situations. Columbus: Ohio State University, 1980.

State FFA Nursery and Landscape Contest. Austin: Texas Education Agency, 1984.

Transplanting, Guying, and Staking Landscape Plants. Columbus: Ohio State University, 1982.

Wetland Wildflowers. Columbus: Ohio State University, 1980.

Woodland Wildflowers. Columbus: Ohio State University, 1980.

Computer Software

Agri-Quiz: Nursery Landscape Quiz. West Bend, Wis.: Midwest Agribusiness Services, 1984.

Landscape Design. Design Your Own Home Series. Novato, Calif.: Avant-Garde, 1984.

Sources for Instructional Materials

The following organizations are sources from which you can acquire instructional materials:

Print Materials

AAVIM
120 Driftmeir Engineering Center
Athens, GA 30602

AgAccess
P. O. Box 2008
Davis, CA 95617

A.C.S. Software Publishing
P. O. Box 5034
Oregon City, OR 97045

Bedding Plants
2043 Hamilton Road
P. O. Box 286
Okemos, MI 48864

BLS Inc.
2503 Fair Lee Road
Wilmington, DE 19810

Careers Inc.
Educational Researchers and Publishers
1211 10th Street, SW
P. O. Box 135
Largo, FL 34649-0135

Chevron Chemical Company
Public Relations
P. O. Box 3744
San Francisco, CA 94119

Education Design
47 W 13th Street
New York, NY 10011

Educators Progress Service
214 Center Street
Randolf, WI 53956

Encyclopedia Britannica Education Corporation
425 N Michigan Avenue
Chicago, IL 60611

Fearon Education
David Street Lake Publishers
19 Davis Drive
Belmont, CA 94002

Guidance Associates
Communications Park, Box 3000
Mount Kisco, NY 10549-0900

Horticultural Books
P. O. Box 107
Stuart, FL 33494
Attn: Edwin A. Menninger

The Idea Bank
P. O. Box 23994
Tempe, AZ 85282

Interstate Printers & Publishers
P. O. Box 50
Danville, IL 61834-0050

Landscape Specialists
44280 McKenzie Highway
Leaburg, OR 97489

National Farm Book Company
5149 Highway T
P. O. Box 206
Amherst, WI 54406

ORTHO--Chevron Chemical Company
742 Bancroft Way
Berkeley, CA 94710

Safety and Systems Management
13895 Industrial Park Boulevard
Minneapolis, MN 55441

Safety Rules
3727 Joan Drive
Waterloo, IA 50702

Southfornet Science Library
University of Georgia
Athens, GA 30602

Teaching Aids
P. O. Box 1798
Costa Mesa, CA 92628-7098

Telsco Industries
Box 18205
Dallas, TX 75218

Thompson Publications
P. O. Box 9335
Fresno, CA 93791

The Training Files
1001 Bridgeway, Suite 304
Sausalito, CA 94965
Attn: Betty Yett or Frances Martin

University of California
Division of Agriculture & Natural Resources
6701 San Pablo Avenue
Oakland, CA 94608-1239

Audiovisual Materials

Audio-Forum
96 Broad Street
Guilford, CT 06437

Audio Visual Production
Department of Horticulture
Purdue University
West Lafayette, IN 47907

Audio-Visual Resource Center
8 Research Park
Cornell University
Ithaca, NY 14850

The AVI Publishing Company
250 Post Road, E
P. O. Box 831
Westport, CT 06881

Close-Up Photo
4 Little River Lane
Hendersonville, NC 28739

Coast Telecourses
10231 Slater Avenue
Fountain Valley, CA 92708

Creative Educational Video
5147-A 69th Street
Lubbock, TX 79424

Educational Filmstrips
1464 19th Street
Huntsville, TX 77340

Landscape Specialists
Videotape Division
28505 Siesta Lane
Eugene, OR 97402

Michigan Media
The University of Michigan
Media Resource Center
400 Fourth Street
Ann Arbor, MI 48103

Modern Talking Picture Service
5000 Park Street, N
St. Petersburg, FL 33709

National Audiovisual Center
Washington, DC 20409

National Information Center for
Educational Media
P. O. Box 40130
Albuquerque, NM 87196

The National Video
Clearinghouse
100 Lafayette Drive
Syosset, NY 11791

Photocom
Box 3135
Pismo Beach, CA 93449

Reinforcement Agri-Media
Media Distribution
University of Minnesota
Box 734 Mayo
Minneapolis, MN 55414

Vernard Films
Box 1332
Peoria, IL 61654

Vocational Media Associates
P. O. Box 1050
Mount Kisco, NY 10549-0050

For more information about instructional resource materials, refer to the Program Guide for Ornamental Horticulture (1986) or contact the Instructional Materials Service, 305 Rolfs Hall, University of Florida, Gainesville, FL 32611, (904) 392-0502, SUNCOM 622-0502.

FEIS Service

If you need (1) information about copyright; (2) a list of instructors teaching in agriculture programs in Florida; (3) journal articles or project reports on specific topics; (4) curriculum and instructional materials; or (5) information on current trends, issues, and research, please contact the Florida Educational Information Service (FEIS), Center for Instructional Development and Services, College of Education, Florida State University, 2003 Apalachee Parkway, Tallahassee, Florida 32301, (904) 487-2054. FEIS will tailor its service to meet your needs on information concerning resource materials.

APPENDIX

Sample Student Learning Guide

SAMPLE

STUDENT LEARNING GUIDE_____

Program: Floriculture

Course: Floriculture 2

Intended Outcome: Prepare Soils and Planting Media

SPS 01.09: Sterilize Soils for Field-grown Crops

Introduction: You have learned how to sterilize plant media in a greenhouse or in flats. Just as plants grow better in sterile media, crops grow better in sterile fields. Therefore, as a prospective floriculture worker, you must learn how to sterilize soils for field-grown crops. In this learning guide, you will study different techniques of sterilization for different field situations.

OBJECTIVES

Knowledge Objectives

1. Differentiate between sterilizing and pasteurizing soils.
2. Differentiate between steam and chemical sanitation of soil regarding the effects of each method on soils.
3. Name and characterize some of the chemicals used for soil sterilization.
4. Describe the sterilization process used in field production.
5. Identify the safety precautions to observe when sterilizing or pasteurizing soils.
6. Identify the application rate for sterilization of soils and the temperature and length of time for steam pasteurization of soils.

Performance Objective

Given a treatment chemical, an infected field, and a tractor equipped with a pump or similar-type system, sterilize the soil.

Your performance on all tasks listed below should be evaluated as satisfactory.

Tasks

1. Check to make sure all parts of the tractor and applicator are in good working condition.
2. Read and follow all safety precautions regarding the use of methyl bromide gas.
3. Connect the steel tank containing the methyl bromide gas to the supply pump, and connect a tank of liquid nitrogen to pressurize the system.
4. Connect the gas cylinders to the equipment and bring it to the required pressure.
5. Run down the row, continually ensuring that the gas is being suitably covered with and sealed under the plastic by the sweeps, which cover the edges of the plastic with soil.
6. Put plants or seeds in the ground when the prescribed time period has elapsed.
7. Dispose of the used gas cylinders, following the maufacturer's instructions, and store the unused cylinders safely.
8. Clean and store all other equipment after use.

RESOURCES

References

Ball, Vic, ed. The Ball Red Book. 14th ed. Englewood Cliffs, N.J.: Reston Publishing Co., 1984.

The Nursery Worker, Student Manual. Columbus: The Ohio State University, 1984.

Tools, Equipment, and Supplies

A field requiring pasteurization
Gas for fumigation (methyl bromide)
A tractor
A pressure pump (vorlex)
A tank of liquid nitrogen
Feeder lines and hoses
Hollow-tined cultivating chisels
Rollers with plastic (black mulching plastic)

NOTE: **This page is included only in the teacher's copy.**

LEARNING ACTIVITIES

Objective: Sterilize soils for field-grown crops.

Procedures

1. Read The Nursery Worker, Student Manual, pp. 34-36, for methods of soil sanitation.
2. Read The Ball Red Book, pp. 110-119, for soil sterilization.
3. Study the Information Sheet for the pasteurization process for field production.
4. Complete the Self-check and check your answers with the Answer Sheet.
5. Complete the Activity Sheet and check with your instructor, if necessary.
6. Complete the Written Test.
7. Complete the Performance Test.

INFORMATION SHEET

The following is a basic procedure for sterilizing the soil in a given field, using a treatment chemical and a field tractor equipped with a pump or similar-type system:

1. Check and adjust all parts of the tractor and applicator properly for synchronization and coordination.

2. Check the supply pump and hollow-tined cultivating chisels for even distribution of the gas.

3. Ensure that the rollers that dispense plastic are in working condition.

4. Read and follow all safety precautions regarding the use of methyl bromide gas.

5. Connect the steel tank containing the methyl bromide gas to the supply pump.

6. Connect a tank of liquid nitrogen to pressurize the system.

7. Connect the gas cylinders to the equipment and bring it to the required pressure.

CAUTION: The gas is extremely toxic. The lines going to the cylinders must be tightened securely. If the system leaks, turn off the cylinders and tighten them.

8. Operate the tractor and the sterilization unit to ensure that

   a. the treatment chemical is fed into the soil evenly and uniformly
   b. the plastic covering is secured with soil at its outer margins in order to prevent any escape of the fumigant chemical.

CAUTION: Continually ensure that the gas is being suitably covered with and sealed under the plastic by the sweeps, which cover the edges of the plastic with soil.

9. At the end of each run, check the chisels to make sure each one is still dispensing gas.

10. Using a shovel, seal the plastic at the beginning and end of each row with soil.

11. Make sure that either plants or seeds are not put in the ground until the prescribed time period has elapsed.

12. Dispose of the used gas cylinders, following the manufacturer's instructions, and store the unused cylinders safely.

13. Clean and store all other equipment after use.

Complete the Self-check beginning on the next page.

SELF-CHECK

Directions: Circle your answer (a, b, c, or d) to each of the following questions.

1. Which of the following are the **two** best known ways of sterilizing soils?

   a. steam
   b. sunlight
   c. freezing
   d. chemicals

2. How does steam sterilizing affect soil?

   a. It decreases soil granulation.
   b. It changes soil texture and color.
   c. It increases ammonium salts in the soils.
   d. It destroys nitrogen in the soil.

3. Which of the following is an important factor for chemical sterilization?

   a. soil temperature
   b. soil color
   c. soil moisture
   d. soil texture

4. Which of the following is killed instantly at 140°F?

   a. weeds
   b. bacteria
   c. fungi
   d. nematodes

5. Which of the following chemicals is sold as a liquid in a pressure can and used as a soil fumigant?

   a. calcium cyanamide
   b. malathion bromide
   c. methyl cyanamide
   d. methyl bromide

Check your answers with the correct ones provided on the Answer Sheet.

ANSWER SHEET FOR SELF-CHECK_____

1. a, d
2. c
3. c
4. c
5. d

If any of your answers is incorrect, review the appropriate part(s) of the instructional materials listed on the Learning Activities sheet.

If you feel confident that you have achieved the objective on soil sterilization, go on to the Activity Sheet.

ACTIVITY SHEET_____

Directions: Tell your instructor that you are ready to sterilize soil for practice. Your instructor and you should make necessary arrangements for this activity. Sterilize the soil, using the treatment chemical, an infected field, and a field tractor equipped with a pump. Evaluate your work using the following checklist.

Task	Yes	No
1. Made sure all parts of the tractor and equipment were properly synchronized and coordinated?		
2. Observed all safety precautions regarding the use of methyl bromide gas?		
3. Connected the methyl bromide gas steel tank to the supply pump, and connected a tank of liquid nitrogen to pressurize the system?		
4. Connected the gas cylinders to the equipment and brought it to the required pressure?		
5. Operated the tractor and the sterilization unit, ensuring that the gas was being suitably covered with and sealed under the plastic?		
6. Put plants or seeds in the ground after the prescribed time period had elapsed?		
7. Disposed of the used gas cylinders in the manner prescribed by the manufacturer, and stored the unused cylinders safely?		
8. Cleaned and stored all other equipment?		

All of the above tasks should be rated "Yes." If so, and if you feel confident that you have achieved this SPS, tell your instructor that you are ready to take the written test.

If any of the above tasks was rated "No" or if you don't feel confident about this SPS, check your work with your instructor.

WRITTEN TEST_____

Student's Name _____

Directions: Circle the best answer (a, b, c, or d) to each of the following questions.

1. Which of the following statements **best** describes soil sterilization?

   a. It removes antagonistic organisms from the soil.
   b. It kills some microorganisms in the soil.
   c. It kills some planting pests in the soil.
   d. It removes all weeds in the soil.

2. Which of the following is a soil sterilization method?

   a. sunlight exposure
   b. heat
   c. extreme cold
   d. flooding

3. Which of the following chemicals is built up after steaming soil?

   a. manganese
   b. nitrogen
   c. ammonia
   d. nitrate

4. Which of the following describes methyl bromide?

   a. It is very safe to use.
   b. It requires no cover of the soil being treated.
   c. It is very toxic to humans.
   d. It is used effectively below 40°F.

5. Which **three** of the following are controlled by soil sterilization?

   a. nematodes
   b. weeds
   c. fungi
   d. ammonium

NOTE: This written test is included only in the teacher's copy.

WRITTEN TEST ANSWER KEY

1. a
2. b
3. c
4. c
5. a, b, c

NOTE: This answer key is included only in the teacher's copy.

PERFORMANCE TEST _____

Directions: Tell the student to sterilize the soil. Provide treatment chemical, an infected field, and a field tractor equipped with a pump or similar-type system. Then evaluate the student's performance using this checklist.

Student's Name: _____

Evaluator: _____ Date: _____

Task	Evaluator's Ratings	
	Satisfactory	Not Satisfactory
1. Made sure all parts of the tractor and equipment were properly synchronized and coordinated?		
2. Observed all safety precautions regarding the use of methyl bromide gas?		
3. Connected the methyl bromide gas steel tank to the supply pump and connected a tank of liquid nitrogen to pressurize the system?		
4. Connected gas cylinders to the equipment and brought it to the required pressure?		
5. Operated the tractor and the sterilization unit, ensuring that the gas was being suitably covered with and sealed under the plastic?		
6. Made sure that either plants or seeds were not put in the ground until the prescribed time period had elapsed?		
7. Disposed of the used gas cylinders in the manner prescribed by the manufacturer, and stored the unused cylinders safely and with care?		
8. Cleaned and stored all other equipment?		

Comments: _____

_____

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